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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

GARCIA, ERNESTO

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/684,684	<b>Applicant(s)</b> YAMANAKA ET AL.	
	<b>Examiner</b> ERNESTO GARCIA	<b>Art Unit</b> 3679	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 29 November 2007.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,4-11 and 21-26 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,4-11 and 21-26 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 November 2007 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

### ***Drawings***

The drawings were received on November 29, 2007. These drawings are acceptable; however, the replacement drawings contain a few discrepancies and not all drawing objections have been overcome.

The drawings are objected to because reference character "2e" and "2f" in Figures 10 and 11 have been designated to the same part. Note that this objection has been previously corrected on the drawings changes filed on April 29, 2005. The current drawings appear to be made relative to the original drawings. Further, Figure 14 is misleading since the caulked portions appear to have holes. Accordingly, the bottom of the caulked portion is missing as shown in Figure 11.

Further, the top surface of the caulked portion in the axial groove in Figure 11 should be dented. The bottom surface of the caulked portion in the axial groove has a projection but not the top surface and therefore has to be shown. Further, the applicants remark that the dent degree of the top portion is smaller than that of the

bottom portion. The remarks have been noted; however, this has to be shown in exaggeration since one would question how one arrives to such configuration without deforming the top surface especially when the tool in Figures 15A and 15B merely provide for making a circumferential dent and the wall thickness does not remain constant through out the caulked portion.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended". If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the examiner does not accept the changes, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Specification***

The disclosure is objected to because of the following informalities:

on paragraph [029], the description of Figures 20A-20D should reflect that this is the stress distribution at the cross-section shown in Figure 13 as argued against the drawings objections made to Figures 20A-20D; and,

on paragraph [0064], the description makes reference to “four opposed faces” engaging with the axial caulked part 60b. It is unclear what four faces the specification is referring to since the axial groove just has two faces 2i. This passage should include the reference characters that correspond to the four faces or requires other correction. Appropriate correction is required.

### ***Double Patenting***

Applicant is advised that should claim 4 be found allowable, claim 25 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k). With respect to claim 4, since claim 1 has set forth that the caulked portion is at the intersection and claim 4 further limits the caulked portion being wider than the axial groove, the caulked portion apparently would be at the intersection

and part of the circumferential groove adjacent to the intersection as claimed in claim 25.

***Claim Rejections - 35 USC § 103***

Claims 1, 4-7, 9, 11, and 23-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chikaraishi, JP-11-248562, in view of Dent, 3,652,111.

Regarding claim 1, Chikaraishi discloses, in Figure 2, a structure comprising a first shaft member **3**, a second shaft member **2**, a surrounded member **2A**, a cylindrical member **10**, and a torque detection coil **20B**. The first shaft member **3** is formed out of a first material. The first shaft member **3** has an outer periphery formed with an axial groove **11** and a circumferential groove **12** (see Figure 3). The axial groove **11** and the circumferential groove **12** have a cross-section having opposed faces substantially parallel to each other. The second shaft member **2** is fixed to the first shaft member **3** via a torsion bar **4**. The surrounded member **2A** is formed out of a magnetic material (similar to that of the shaft) and fixed to the second shaft member **2**. The cylindrical member **10** is fitted to the outer periphery of the first shaft member **3**. The cylindrical member **10** has a portion facing the surrounded member **2A**. The cylindrical member **10** is formed out of a second material greater in linear expansion coefficient than the first material (aluminum is greater in linear expansion than iron used to make the shafts). The second material is conductive non-magnetic metallic material. A caulked

portion **13** is provided to the cylindrical member **10** partly at an intersection of the axial groove **11** and the circumferential groove **12**. The caulked portion **10** has a continuous and deformed inner surface in press contact with the opposed faces of the axial groove **11** (see Figure 5a) and the circumferential groove **12**.

However, Chikaraishi fails to disclose the axial groove **2e** being greater in depth than the circumferential groove **2d**. Dent teaches, in Figure 3, an axial groove **64** being greater in depth than a circumferential groove **36** (See Dent; col. 4, lines 35-38). Dent does not explicitly explain the reason for making the axial groove greater in depth than that of the circumferential groove; however, it appears that placing the axial groove or the circumferential groove greater in depth than that of the other allows swaging of the material to penetrate deeper into the groove to hold with a greater compression force as compared to the depths being the same. Therefore, as taught by Dent, it would have been obvious to one of ordinary skill in the art at the time the invention was made to make the axial groove be greater in depth than the circumferential groove to swage the caulked portion deeper into the axial groove to provide a greater compression force to connect the first shaft member to the cylindrical member.

Regarding claim 4, given the modification a circumferential width of the caulked portion would have been greater than a circumferential width between the opposed faces of the axial groove **11** at the intersection.

Regarding claim 5, given the modification, a first caulked part would have corresponded to the circumferential groove **12** and a second caulked part corresponding to the axial groove **11**. The second caulked part would have been arranged substantially in a middle of the first caulked part.

Regarding claim 6, the axial groove **11** comprises a plurality of groove portions in a circumferential direction.

Regarding claim 7, the groove portions are three in number.

Regarding claim 9, the cylindrical member **60** is apart from the first shaft member **2**. However, Chikaraishi fails to disclose the cylindrical member being apart from the first shaft member by a clearance except at the caulked portion **18**. Applicants are reminded that using the technique of Dent allows for a clearance to be present since one needs to slidably fit the cylindrical member to the first shaft member thus requiring a clearance to provide for a sliding fit (col. 4, lines 14-21). Therefore, as taught by Dent, it would have been obvious to one of ordinary skill in the art at the time the invention was made to make the cylindrical member apart from the first shaft member by a clearance except at the caulked portion to provide for the shaft member to slidably fit over the first shaft member which allows for ease of insertion.



Regarding claim 11, the first shaft member **3** comprises an input shaft or an output shaft. The second shaft member **2** comprises the output shaft. The input shaft and the output shaft are arranged relatively rotatably with respect to each other.

Regarding the intended use recitation, it is the patentability of the product and not how it is intended to be used that is to be determined. No structure is imparted to the shafts by this recitation of intended use. Nevertheless, the input shaft and the output shaft can be used for a torque sensor of an electric power steering apparatus.

Regarding claim 21, Chikaraishi discloses, in Figure 2, a structure comprising a first shaft member **3**, a second shaft member **2**, a surrounded member **2A**, a cylindrical member **10**, and a torque detection coil **20B**. The first shaft member **3** is formed out of a first material. The first shaft member **3** has an outer periphery formed with at least one of an axial groove **11** and a circumferential groove **12**. The axial groove **11** has a cross-section having opposed faces substantially parallel to each other. The second shaft member **2** is fixed to the first shaft member **3** via a torsion bar **4**. The surrounded member **2A** is formed out of a magnetic material (similar to that of the shaft) and fixed to the second shaft member **3**. The cylindrical member **10** is provided to the outer periphery of the first shaft member **3**. The cylindrical member **10** has a portion facing the surrounded member **2A**. The cylindrical member **10** is formed out of a second material (aluminum) greater in linear expansion coefficient than the first material (iron). The second material is a conductive non-magnetic metallic material (aluminum is non-magnetic). A caulked portion **13** is provided to the cylindrical member **10** at a position

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corresponding to the axial groove **11** of the first shaft member **3**. The caulked portion **13** has a deformed inner surface in press contact with the opposed faces of the circumferential groove **12**. The cylindrical member **10** is spaced apart from the first shaft member **3**.

However, Chikaraishi fails to disclose the cylindrical member **10** being apart from the first shaft member by a clearance except at the caulked portion **13**. Applicants are reminded that using the technique of Dent allows for a clearance to be present since one needs to slidably fit the cylindrical member to the first shaft member thus requiring a clearance to provide for a slidable fit (see Dent; col. 4, lines 14-21). Therefore, as taught by Dent, it would have been obvious to one of ordinary skill in the art at the time the invention was made to make the cylindrical member apart from the first shaft member by a clearance except at the caulked portion to provide for the shaft member to slide fit over the first shaft member which allows for ease of manufacturing.

Regarding claim 23, given the modification the clearance would have been sufficient to loosely fit an inner periphery side of the cylinder member **10** over the outer surface of the first shaft member **3**.

Regarding claim 24, the clearance is established at ordinary temperature.

Regarding claim 25, the caulked portion **13** is provided to the cylindrical member **10** at the intersection of the axial groove **11**, the circumferential groove **12**, and part of the circumferential groove adjacent to the intersection.

Regarding claim 26, the first shaft member **3** has the outer periphery formed with axial grooves **11**. The caulked portion is provided at each of the axial grooves **11**. Further, given the modification, the clearance would have existed between the cylindrical member **10** and the first shaft member **3** in between the caulked portions.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chikaraishi, JP11-248562, in view of Dent, 3,652,111, as applied to claims 1, 6, 7, 9, 11, 21, 23, and 24, and further in view of Fujioka et al., 4,716,756.

Regarding claim 8, Dent, as discussed, fails to disclose the axial groove **64** and the circumferential groove **36** being rectangular. Applicants are reminded that a change in the shape of a prior art device is a design consideration within the skill of the art. In re Dailey, 357 F.2d 669, 149 USPQ 47 (CCPA 1966). Fujioka et al. equally teach a groove being rectangular to make a connection. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to design the groove be rectangular in cross section as taught by Fujioka et al., Fig. 8, since such groove will perform equally well to make a connection.

Claims 10 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chikaraishi, JP11-248562, in view of Dent, 3,652,111, as applied to claims 1, 6, 7, 9, 11, 21, 23, 24, and 26, and further in view of Edgemon, Jr., 3,642,311.

Regarding claim 10, Dent fails to disclose the axial groove **64** having an opening edge formed at an acute angle. Edgemon, Jr. teaches, in Figure 2, an axial groove **18** having an opening edge formed at an acute angle. Edgemon, Jr. does not state why the opening edge is formed at an acute angle. Applicant is reminded that side faces of a rectangular axial groove formed on a cylindrical surface inherently form an opening edge at an acute angle as part of an inherent feature when using rectangular grooves. Therefore, as taught by Edgemon, Jr., it would have been obvious to one of ordinary skill in the art at the time the invention was made to make the axial groove of Dent with an opening edge formed at an acute angle as part of forming an axial groove being rectangular on a cylindrical surface instead of using semicircular grooves since a rectangular groove requires less machining than a semicircular groove.

Regarding claim 22, given the modification the opening edge will be inherently formed at an acute angle at the intersection since all the grooves will be modified to rectangular grooves.

### ***Response to Arguments***

Applicants' arguments with respect to claims 1, 4-11, and 21-26 have been considered but are moot in view of the new grounds of rejection.

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Chikaraishi, US6,328,128, teaches in Figures 3 and 4, axial and circumferential grooves in cross-section, which suggests to one skilled in the art using a caulked portion.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ernesto Garcia whose telephone number is 571-272-7083. The examiner can normally be reached from 9:30AM-6:00PM. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Daniel P. Stodola can be reached at 571-272-7087.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Daniel P. Stodola/  
Supervisory Patent Examiner,  
Art Unit 3679

E.G.

February 28, 2008

/E. G./

Examiner, Art Unit 3679